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NASA TECH BRIEF

Computer Program Reduces Calculation Time of Normal Response Functions

The problem:

To devise a method for rapidly calculating parameters of maximum likelihood estimates (MLE's) resulting from sensitivity experiment data populations given in cumulative normal response functions. Experiments requiring estimates of the sensitivity threshold include impact and electrical sensitivity, projectile penetrability and environmental studies, and biological studies such as dosage mortality. The method should provide parameter estimates of the portion of this population (response fractions) which represent the events occurring at a sensitivity threshold. Parameters of these data are often manually computed, a time-consuming process which yields estimates of limited accuracy.

The solution:

A Fortran II computer program that uses the Newton–Raphson iterative procedure to calculate the mean and standard deviation of portions of the cumulative normal response function. Initial first guesses in the iterative procedure may be calculated by the program, or by plotting the fraction of responses occurring at the sensitivity threshold on normal probability paper.

The conditions for selecting either option to calculate the first guess are determined by two factors: well centered vs badly centered data, a few vs many stimulus levels.

For well centered response fractions taken at only a few stimulus levels, the threshold data may be plotted on normal probability paper, with the results used as first guesses. Well centered data taken at a greater number of stimulus levels are inserted into the MOS (Minimum Overlapping Subset) specification statement of the program, and the first guess is computer calculated.

For badly centered data, normal probability paper may not be used, and the first guess is computer calculated.

The program also provides for calculation of the covariance matrix and the confidence band within which the estimates will be found.

Available information pertaining to the program includes: (1) a program description and mathematical analyses of the program, (2) formulas for maximum likelihood estimates of the parameters, (3) numerical methods for obtaining the estimates, (4) a complete program listing, and (5) examples illustrating the use of options as applied to specific data characteristics.

Note:

Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
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Reference: B67-10108

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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